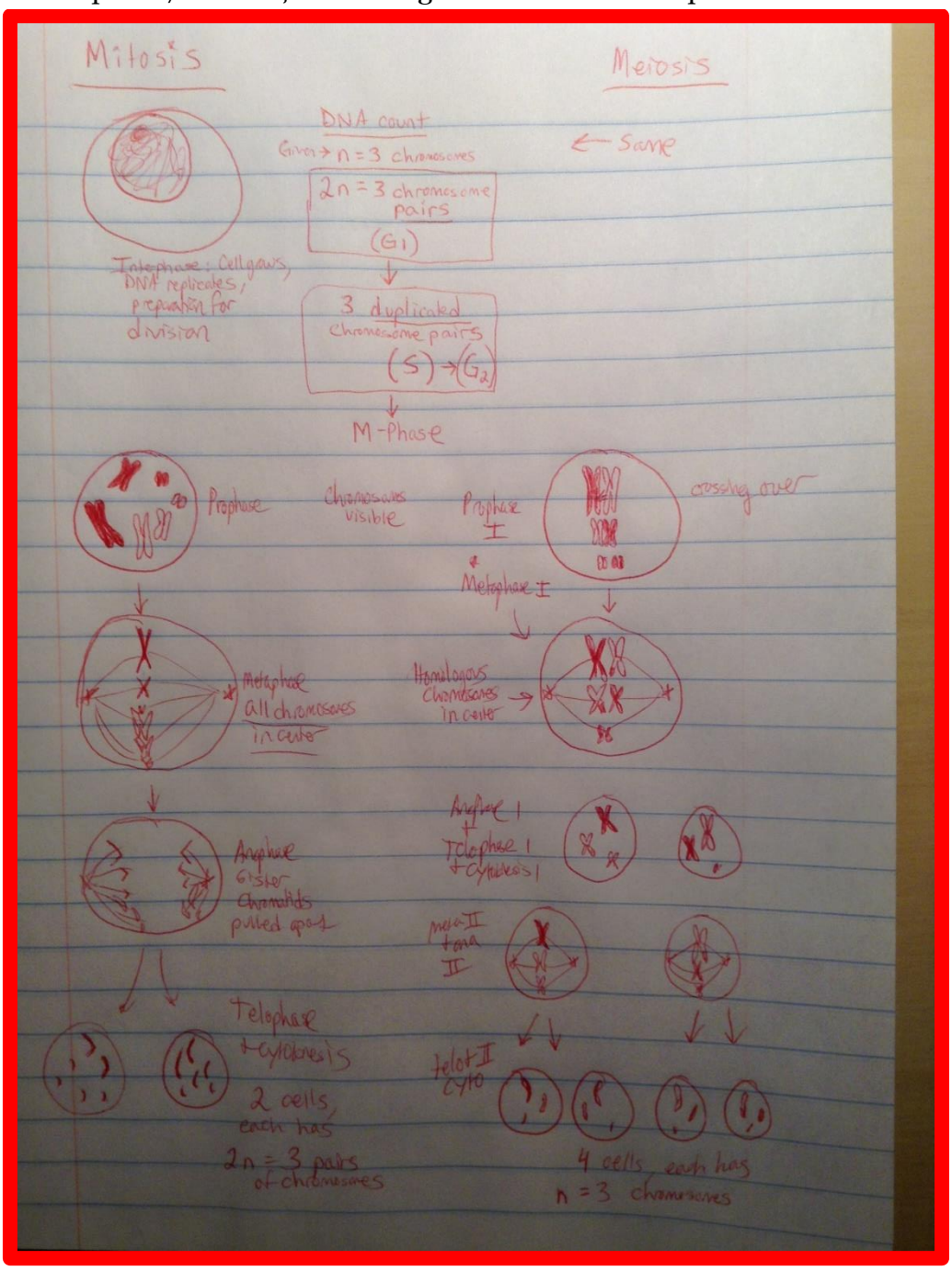
3.2 Exam Review ANSWER KEY

1. Compare & Contrast the number of cells produced in mitosis vs. meiosis.
   MITOSIS – 2X CELLS FOR EVERY 1 ROUND.
   MEIOSIS – 4X CELLS FOR EVERY 1 ROUND.
2. Compare & Contrast the type of cells produced in mitosis vs. meiosis.
   MITOSIS – SOMATIC CELLS (NON-SEX CELL), DIPLOID, 2N CHROMOSOMES
   MEIOSIS – GAMETES (SPERM/EGG), HAPLOID, N CHROMOSOMES
3. Compare & Contrast the processes & products of mitosis vs. meiosis.
   MITOSIS – DNA REPLICATES IN INTERPHASE. 1 DIVISION, IDENTICAL CELLS AS PARENT, CHROMOSOMES FORM, ALL LINE UP IN CENTER, SISTER CHROMATIDS PULLED APART, CYTOKINESIS SPLITS CELL INTO 2 CELLS. USED IN ASEXUAL REPRODUCTION (REPAIR, RENEWAL, GROWTH)
   MEIOSIS – DNA REPLICATES IN INTERPHASE. 1ST DIVISION: CHROMOSOMES FORM & HOMOLOGOUS PAIRS CROSS-OVER, HOMOLOGOUS PAIRS LINE UP IN CENTER IN VARIOUS ORIENTATIONS (LAW OF INDEPENDENT ASSORTMENT), HOMOLOGOUS PAIRS PULLED APART (LAW OF SEGREGATION LEADS TO DIFFERENT VARIETIES OF GENE COMBINATIONS AVAILABLE FOR GAMETES), CYTOKINESIS SPLITS CELL INTO 2 CELLS; SECOND DIVISION: ALL CHROMOSOMES LINE UP IN CENTER OF BOTH CELLS, PULLED APART, CYTOKINESIS SPLITS 2 CELLS INTO 4 CELLS. USED IN SEXUAL REPRODUCTION; 1 CELL EACH OF 2 INDIVIDUALS WILL FUSE DURING FERTILIZATION.
4. Describe the parts of cell division requiring energy.
   DNA REPLICATION, CYTOKINESIS, CREATING NEW ORGANELLES, INCREASING IN SIZE, MOVEMENT OF CHROMOSOMES IN METAPHASE & ANAPHASE.
5. Contrast prokaryote & eukaryote cell division. Describe the pros & cons of each.
   PROKARYOTES – BINARY FISSION, NO NUCLEUS/NO LINEAR CHROMOSOMES, SO NO MITOSIS. VERY SIMPLE DIVISION. PROCESS IS FAST, RAPID POPULATION GROWTH. ASEXUAL SO ONLY MEANS OF VARIATION IS MUTATIONS.
   EUKARYOTES – NUMEROUS LINEAR CHROMOSOMES, MUST BE ORDERED & MORE COMPLEX TO DISSOLVE/REFORM NUCLEUS. MORE STEPS, REQUIRES MORE ENERGY, ALLOWS MORE POTENTIAL FOR ERRORS, BUT PROCESS GENERALLY VERY EFFICIENT. MEIOSIS ALLOWS FOR MUCH VARIATION & SEXUAL REPRODUCTION.

6. Describe how Cyclin, MPF, CDK & DNA concentrations change during the cell cycle.
   CYCLIN – LOW BETWEEN END OF G2 & BEGINNING OF G1. ACCUMULATES FROM G1 TO G2, THEN COMBINES WITH CDK TO DECREASE THE AMOUNT OF "FREE CYCLIN" SINCE ITS TIED UP WITH CDK.
   CDK – LOW AT BEGINNING OF G2 AS IT COMBINES WITH CYCLIN; QUICKLY RE-PRODUCED & STAYS AT SAME HIGH CONCENTRATION AFTER DISSOCAITED FROM CYCLIN IN MID-MPHASE UNTIL NEXT G2.
   MPF – INCREASES AS CYCLIN & CDK COMBINE (SEE ABOVE) SINCE THIS IS WHAT MPF IS. DECREASES MID-MPHASE AS CYCLIN IS DEGRADED.
   DNA- G1 LOWEST, INCREASES DURING S UNTIL REPLICATION IS COMPLETE, G2 SHOWS HIGHEST SINCE REPLICATION SURE TO BE COMPLETE. M PHASE SHOWS VARIATIONS (HIGH AT FIRST, THEN LOW AFTER CYTOKINESIS) SINCE IT IS SPLIT AMONGST 2 CELLS, COMPLETING THE CELL CYCLE.

7. Contrast the mechanism of cytokinesis & plants & animals.
   PLANTS – NEW CELL WALL FORMS AS GOLGI SECRETES NEW CELL WALL COMPONENTS (CELL PLATE) IN MIDDLE OF CELL. CELL PLATE MATURES COMPLETING DIVISION OF THE CELL IN THE MIDDLE.
   ANIMALS – CONTRACTILE RING OF MOTOR PROTEIN FIBERS CONTRACT & "PINCH" THE MEMBRANE IN BETWEEN THE 2 CELLS.

8. For an organism with n=3, draw out their cells in each phase of Interphase/mitosis & Interphase/meiosis, describing the events of each phase.



9. Differentiate between inheritance patterns on a pedigree.
   SEE NOTES/PROBLEMS
10. Calculate probabilities of events using probability rules.
    SEE NOTES/PROBLEMS
11. Describe mechanisms that account for unexpected genetic outcomes.
    LINKED GENES – GENES DO NOT ASSORT INDEPENDENTLY, LOWER NUMBER OF RECOMBINANTS FOR A HYBRID X DOUBLE-RECESSIVE CROSS.
    EPISTASIS – EFFECTS OF 1 GENE CAUSE OTHER GENE(S) TO BE EXPRESSED OR NOT EXPRESSED.
    POLYGENIC/POLYMORPHIC INHERITANCE – MULTIPLE GENES & THEIR PRODUCTS DETERMINE A SINGLE PHENOTYPE.
    ORGANELLE DNA DOESN'T OBEY NORMAL LAWS
    ENVIRONMENT/DIET CAN INFLUENCE HOW THE POTENTIAL PHENOTYPE ACTUALLY IS EXPRESSED.
    GENOMIC IMPRINTING – PHENOTYPE DETERMINED BASED ON WHETHER MOTHER OR FATHER DONATED ALLELE; MECHANISMS UNCLEAR.
12. Differentiate between X-linked recessive outcomes & autosomal recessive outcomes.
    X-LINKED SHOWS DIFFERENCES BETWEEN MALES & FEMALES, DAUGHTERS CANNOT BE AFFECTED IF FATHER IS UNAFFECTED. AUTOSOMAL DOES NOT EXHIBIT THESE CHARACTERISTICS.
13. Differentiate between autosomal recessive outcomes & autosomal dominant outcomes.
    RECESSIVE DISORDERS CAN BE EXPRESSED BY 2 UNAFFECTED PARENTS, MAKING IT UNDERSTOOD THE PARENTS MUST HAVE BEEN CARRIERS.
    DOMINANT DISORDERS CANNOT SHOW UP IN A CHILD IF PARENTS WERE UNAFFECTED.
14. Differentiate between codominance outcomes & incomplete dominance outcomes.
    CODOMINANT BOTH PHENOTYPES SHOW UP
    INCOMPLETE DOMINANCE A BLEND FORMS
15. Differentiate between epistasis outcomes & multiple alleles outcomes.
    EPISTASIS ONLY HAS 2 ALLELES BUT CAN YIELD 3+ OUTCOMES SINCE THE ACTION OF 1 TRAIT AFFECTS THE EXPRESSION/LEVEL OF A SECOND TRAIT.
    MULTIPLE ALLELES ALWAYS HAS 3+ ALLELES, BUT THEY FOLLOW NORMAL DOMINANT/RECESSIVE/CODOMINANT, ETC. PATTERNS.
16. Differentiate between linked gene outcomes & unlinked gene outcomes; write & test a null hypothesis using Chi Square.
    LINKED GENES HAVE FEWER THAT 50% RECOMBINANTS, UNLINKED GENES DO NOT (FOR A DIHYBRID X DOUBLE-RECESSIVE CROSS).
    SEE NOTES & PROBLEMS FOR CHI SQUARE EXAMPLES
17. Determine a gene map based on given recombination frequencies.
    SEE EXAMPLE ON WIKISPACE.
18. Calculate distances between linked genes using offspring results.
    SEE NOTES/PROBLEMS.